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Elite sport policies and international sporting success: A panel data analysis of European women's national football team performance

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Abstract

Research question: While national sporting governing bodies are encouraged to implement programmes which seek to enhance their international sporting success, comparative studies on elite sport policies have provided limited empirical evidence in support of the relationship between such programmes and the achievement of sporting outcomes. Following the SPLISS framework, this study examines the longitudinal impact of four programme-level factors - financial support, human resources, coaching provision and foundation phase activity - on the international success of women's national football teams.

Research methods: Data from 55 Union of European Football Associations' (UEFA) members were collected over a seven-year-period (2011-2017). The associations between programme-level factors and FIFA ranking points are verified through panel regression analyses. Controls for economic, talent pool, political, socio-cultural, climate and men's football legacy variables are included.

Results and Findings: The results reveal that highly specialised coaching provision has a significant and positive impact on international success in women's football, while our proxies for financial support, human resources and foundation phase activity have no notable explanatory power for the success of women's national teams. A country's economic development, talent pool, climate and men's football legacy are significant predictors of its women's football performance level.

Implications: This paper offers practical insights into the organisation and management of women's football in UEFA nations and contributes to the theoretical debate on comparative analysis of the sporting performance of countries. This article confirms that an exclusively quantitative approach does not permit definitive conclusions to be drawn on the complex relationship between elite sport policies and international sporting outcomes.

Keywords: women's football; national development; international sport success; elite sport performance; sport policy

Introduction

International sporting success at the elite level can provide an indication of the general conditions of a sport in a particular country and is often used by national governments, the media and the public to judge the work of sporting governing bodies' managers and executives (De Bosscher, Shilbury, Theeboom, Van Hoecke & De Knop, 2011; Sotiriadou & De Bosscher, 2018). Therefore, understanding the determinants of international success is of interest to many stakeholders, including public bodies and sport supporters. Yet, identifying factors that predict international sporting success is complicated because managing sport at the elite level is affected by a combination of variables located on the macro (country), meso (sport programme) and micro (athletes) levels (De Bosscher, De Knop, van Bottenburg & Shibli, 2006).

Given this complexity, scholarly debate on comparative analysis of sport policy has reflected on the approaches used to study elite sport systems and on different underlying philosophical positions adopted for comparing the sporting success of nations (Dowling, Brown & Grix, 2018; Henry, Amara, Al-Tauqi & Lee, 2005). Some scholars (e.g. Andersen & Ronglan, 2012; Green & Houlihan, 2005) have taken an interpretivist perspective, explaining that elite sport is part of a broader system embedded within a nation's culture and values. In contrast, other authors (e.g. De Bosscher et al., 2006; De Bosscher, Bingham, Shibli, van Bottenburg & De Knop, 2008; De Bosscher, Shibli, Westerbeek & van Bottenburg, 2015) have pursued what Henry et al. (2005, p. 481) described as "nomothetic, law-like generalisations", employing a more rationalist and positivist method in attempt to identify empirically the structural similarities and differences between sporting nations.

De Bosscher and colleagues' nine-pillar SPLISS (Sport Policies Leading to International Sporting Success) framework is a good example of the rational-economic approach, where the researchers are interested in recognising and testing the factors that influence a country's success in elite sport. This model favours the large-scale application of

empirical data to classify nations in an attempt to benchmark sport policy factors. However, comparative empirical analysis of high performance sport also comes with a number of methodological challenges that impede implementation of a universal and perfect method to conduct cross-national studies (De Bosscher, 2018; Dowling et al., 2018; Henry et al., 2005). For example, operationalisation of sport policy concepts in simple, quantifiable and comparable units is often problematic (Dowling et al., 2018; Henry et al., 2005). Similarly, a series of issues relating to the accessibility, reliability and validity of data (e.g. data standardisation, limitations of using single point data and issues with time-lag) are identified as fundamental problems for comparative sport policy researchers (De Bosscher, 2018; Dowling et al., 2018). As a consequence, such methodological problems, coupled with often insufficient or unreliable information on sport governing bodies' policies, programmes and investments have resulted in the paucity of empirical studies testing the (non) relationship between elite sport policies and success (Brouwers, Sotiriadou & De Bosscher, 2014; De Bosscher, 2018; De Bosscher et al., 2006; Dowling et al., 2018; Henry et al., 2005).

The aim of this article is to examine the empirical association between elite sport policies and international sporting success. This paper follows the SPLISS framework, seeking to model elite sport policies and test their significance as predictors of success in international women's football. Drawing on data collected in member countries of the Union of European Football Associations (UEFA), this paper verifies the longitudinal impact of sport programme-level factors on sporting success. There are two reasons for the focus on UEFA members and women's football. First, according to Barreira, Mazzei and Galatti (2018), UEFA's strategic plans for the development of women's football are in line with the nine pillars identified in the SPLISS framework. Therefore, it is relevant to study elite sport systems that ostensibly are based around a near uniform model of policy development. Second, despite its potential implications for women's football stakeholders in terms of prioritisation of their actions, there

is still a lack of evidence about the empirical association between elite sport policies and international sporting success in this sport (Valenti, Scelles & Morrow, 2018). However, as international football governing bodies have progressively put more emphasis on the development of women's football, more data on the sport have become available. Specifically, since 2011 UEFA has compiled an annual report on managerial and technical aspects of women's football in its member associations. Thus, in contrast to some of the methodological issues for comparative analysis presented above, access to these reports allow us to rely on primary data that are already standardised across countries and to build a panel dataset for longitudinal research. Overall, the purpose of this paper is two-fold:

- (1) to contribute to the debate on the role of elite sport policies as predictors of success, dealing with some of the methodological shortcomings and clarifying the significance and direction of this relationship;
- (2) to discuss practical implications that are relevant for women's football stakeholders, gaining empirical insights on the development of this sport.

The article is structured as follows. Following the introduction, the next section highlights theoretical explanations of factors that contribute to a country's international elite sporting success and reviews related literature in women's football. The third part provides details on how measures for the different programme-level factors are selected, describes the data used for this research, and explains the empirical estimation strategy employed for the analysis. In the fourth section, findings based on panel regression models are presented and discussed. The fifth section concludes by considering major findings and their implications.

Theoretical background and related literature

The SPLISS framework

As a result of a comprehensive review of the literature focussing on the determinants of international sporting success, De Bosscher et al. (2006) systematically evaluated and organised factors linked with international sporting success. This led to the conceptualisation of a theoretical framework which clusters over 100 key success factors into nine sport policy areas (or pillars), i.e. Sport Policies Leading to International Sporting Success (SPLISS). These include: financial support for athletes and personnel; an integrated approach to policy development; foundation phase; talent identification and development system; athletic and post-career support; training facilities; coaching provision and development of coaching expertise; participation in (inter-) national competitions; and support from scientific research and sports medicine.

According to De Bosscher et al. (2006), initiatives and programmes related to these targeted areas (i.e. nine pillars) sustain the foundations of a country's international success. For example, countries that invest more financially in their elite sport system would be expected to create more opportunities for athletes to train under ideal circumstances. In the same way, high-quality facilities, the existence of clear athlete pathways, a strong organisational structure, an established national competition, opportunities for players to train with specialised and qualified coaches and participate in international competitions are all examples of what constitutes a sport system that supports the development of young talents into elite athletes. Similarly, sport systems that encourage a continuous and proactive exchange of information with sport medicine professionals and incentivise the creation of talent identification and development structures contribute to maximising athletes' potential, thus increasing a country's chances of achieving international sporting success. The associations between programmes within these nine targeted areas and sporting success are expected to be positive.

Unlike macro variables (e.g. Gross Domestic Product per capita, population size, socio-cultural conditions), programme-level factors are of particular interest for national governing

bodies (e.g. national football associations) as they are in charge of activities including the establishment of rules and regulations, the design and implementation of strategic plans and programmes, the promotion of participation at grassroots level, and the general supervision and management of elite sporting performances (De Bosscher et al., 2006; Hoehn, 2006)¹. In this regard, the SPLISS model identifies pivotal issues in benchmarking sport systems and provides a tentative theoretical assumption that sport governing bodies that work to improve these sport policy areas are more likely to obtain international success.

The nine pillars of the SPLISS model essentially represent strategic policies that underpin the development of successful national elite sport development systems. Each pillar can be operationalised and measured through a number of critical factors, thus allowing for evaluation and comparison across countries (De Bosscher et al., 2006). In a recent study, De Bosscher (2018) notes that most pillars correlate positively and significantly with sporting success. Yet, these correlations do not indicate any causality. Moreover, it is important to consider that some initiatives might take longer than others to demonstrate their impact due to potential learning effects. For instance, grassroots initiatives (e.g. including the sport in school curricula or promoting links between schools and clubs) would be expected to influence elite sport performance over a longer period. On the contrary, programmes concerned directly with the management of the national team (e.g. hiring an experienced and qualified coach) would be expected to have a more immediate effect. In line with this, national football associations (NFAs) often design their strategic plans to reflect both short- and long-term goals, seeking to support and grow the grassroots game while continuing to strive for success at the elite level (see e.g. Irish Football Association, 2014; The Football Association, 2016).

¹ In this study, we do not test for the effect of micro-level factors. For this reason, we do not introduce these variables at this stage. This is also to avoid creating confusion about the overall purpose of the paper.

Determinants of international success in women's football

The Fédération Internationale de Football Association (FIFA) has stressed the importance of developing the women's game as a key objective for the future of football (FIFA, 2014, 2016). Accordingly, continental football federations have started to implement a number of strategic plans and investments with the aim of developing women's football worldwide (FIFA, 2014). As a result, NFAs were urged to deliver sport programmes to foster the women's game in their respective countries. These included initiatives to increase youth participation, improve infrastructures, expand competitions, strengthen grassroots activities and, more generally, provide appropriate playing environments for players, officials and spectators (UEFA, 2017).

With such development efforts ongoing, it becomes relevant to study the impact that NFAs' programmes have on the performance of their women's national teams. In addition, international success at the elite level has been associated with increased amateur participation (e.g. Mutter & Pawlowski, 2014; Frick & Wicker, 2016)². However, empirical evidence testing the role of programme-level factors in predicting women's football success is limited to one contribution (Jacobs, 2014).

Sport programme-level factors

Jacobs's (2014) study is the first attempt to look at the effect of sport programme-level variables in women's football, computing dummy variables for four policy areas: human resources, training availability, talent development and foundation phase. Adapting information from FIFA surveys, investment in human resources is controlled based on whether an NFA has a minimum of three full-time staff working in its women's football department;

² Although other studies have failed to identify the existence of a clear "trickle-down effect" (see e.g. De Bosscher et al., 2013; Storm, Nielsen & Jakobsen, 2018; Weed et al., 2015).

training availability is represented by the possibility for senior national players to train at least four times a week; talent development is dependent on whether youth national teams train at least four times a week; and finally, the presence of women's football in school curricula indicates an NFA's efforts to promote the sport at the foundation phase. In this study, Jacobs estimates a linear equation to check associations between programme-factors and a country's international sporting success (measured via its FIFA Women's World Ranking points). The equation to predict each country's sporting success in women's football is expressed as a function of the selected sport programme-level indicators and macro-level factors. However, due to the availability of data on programme-level factors being limited to one year, the effects of sport programmes on success were only measured through lagged variables at specific points in time (i.e. short-term: after one year; and long-term: after six years).

Results of this research support the importance of sport programme-factors in predicting international sporting success in women's football (Jacobs, 2014). Specifically, Jacobs's study indicates that these account for about 5 per cent of the variance at the net of macro-level variables. Moreover, in this study, Jacobs provides evidence in support of the hypothesis that sport programmes may take some time to display their effects. For instance, investment in human resources and training availability for the senior national team are associated with improved international performance in the short-term (i.e. after one year). Whereas NFAs that invest in human resources, and at the same time have a talent identification and development system in place, can expect to produce better international performances in the long-term (i.e. after six years). Finally, positive but non-significant association is found between programmes at the foundation phase and long-term success (i.e. after six years).

Notwithstanding the contribution Jacobs (2014) makes by providing the first examination of the effect of programme-level factors on international sporting success in women's football, the approach used in the research has some limitations. First, given that

information on programme-level factors are only available for one year, the concrete and causal effect of programmes on sporting success cannot be identified. Instead, only the existence of an association can be argued. As acknowledged by the author, “longitudinal data [...] would have been optimal for this analysis” (Jacobs, 2014, p. 535). Second, although macro variables are included to control for a country’s characteristics, cross-sectional information does not allow unobserved country-level heterogeneity to be taken into account. In an attempt to overcome these limitations, our study will analyse the impact of programme-level factors longitudinally. In fact, through UEFA reports we have access to repeated measurement of programme-level factors within the same set of countries over a period of seven years. Furthermore, due to the nature of panel analysis, our study will control for country and year effects and distinguish within-country variation from between-country variation, therefore extending understanding of whether and how NFAs’ programmes impact a country’s international sporting success.

Country-level factors

As found by Jacobs (2014), sport programme-level factors can be associated with a marginal percentage of a country’s international elite sporting success, while macro-level factors are consistently found as predictors of over 50 per cent of the variance (see e.g. Bernard & Busse, 2004; De Bosscher, De Knop & van Bottenburg, 2007; De Bosscher, De Knop & Heyndels, 2003; Johnson & Ali, 2004). Previous studies on the determinants of international success in women’s football have investigated extensively the role of these factors and this literature is reviewed in the following sections.

Economic development and talent pool. A country’s wealth (i.e. Gross Domestic Product or Gross Domestic Product per Capita) has a positive effect on a country’s international sporting success, suggesting that in economically developed countries women have either more leisure

time or availability of better sport infrastructures (Brendtmann, Carsten & Otten, 2016; Cho, 2013; Congdon-Hohman & Matheson, 2011; Hoffmann, Ging & Ramsay, 2006; Jacobs, 2014; Klein, 2002; Torgler, 2008). Similarly, talent pool, estimated either via total population (Congdon-Hohman and Matheson, 2011; Hoffmann et al., 2006, Klein, 2002; Torgler, 2008) or female population (total and age-specific) (Cho, 2013), is positively associated with international success, indicating that countries with a larger population have a greater likelihood to succeed due to the larger talent pool from which NFAs can select players.

Climate. It has been observed that countries with temperate climates are advantaged in sports that are mainly played outdoors, extremely hot or cold conditions making it more difficult for players to practice frequently (Hoffmann, Ging & Ramasamy, 2002). For example, countries with an annual average temperature approximating 14°C perform significantly better in men's football (Gelade & Dobson, 2007; Hoffmann et al., 2002; Macmillan & Smith, 2007). Nevertheless, existing articles on women's football find inconsistent results. Three studies (Congdon-Hohman & Matheson, 2011; Jacobs, 2014; Torgler, 2008) associate colder temperature with international women's football success, while two other articles (Brendtmann et al., 2016; Hoffmann et al., 2006) display non-significant results.

Socio-cultural. The influence of socio-cultural variables such as religion, gender equality and cultural heritage was also explored in relation to international women's football outcomes. For example, Klein (2002) finds non-significant effects of religion as a determinant of women's football success. However, Congdon-Hohman and Matheson (2011) note that countries where the majority of population is of Islamic faith perform significantly worse, arguing that women have limited opportunities to play sport in Muslim countries. Furthermore, previous literature positively associates a country's level of gender equality (e.g. female-to-male labour force, Gender Inequality Index) with its international performance in women's football (Brendtmann et al., 2016; Cho, 2013; Congdon-Hohman & Matheson, 2011; Hoffmann et al., 2006; Jacobs,

2014; Klein, 2002), suggesting that countries where women are provided with equal opportunities in society are more likely to invest in women's sports. Hence, women have more opportunities to participate in sport and potentially improve their skills. In addition, it has been found that countries with Latin cultural heritage perform significantly better in men's football than those with non-Latin heritage due to the historical popularity of the sport among Luso-Hispanic countries (Hoffman et al., 2002; Leeds & Leeds, 2009; Macmillan & Smith, 2007; Torgler, 2004). Yet having a Latin cultural heritage is not identified as a factor for success in international women's football (Congdon-Hohman & Matheson, 2011; Hoffmann et al., 2006; Jacobs, 2014).

Political system. The focus of earlier research was on the effects that the (past or current) presence of a Communist regime has on a country's international performance in women's football. Two articles associate Communism with higher levels of performance in women's football (Congdon-Homan & Matheson, 2011; Hoffmann et al., 2006), while Jacobs (2014) cannot find support for this relationship. In men's football, two studies (Papanikos, 2017; Scelles & Andreff, 2017) utilised Democracy Index³ (The Economist Intelligence Unit, 2016) to control for political system. Papanikos (2017) argues that more democratic countries field stronger national teams, while Scelles and Andreff (2017) report opposite results. It is worth noting that democracy level moderates gender differences in sport participation and is positively associated with increased participation rates, especially for women (Balish, 2017). However, previous articles have not examined democracy as a determinant of success in women's football.

³ Democracy Index is a weighted average indicator based on sixty indicators grouped in five categories measuring pluralism, civil liberties and political culture. The index ranges from 0 (Authoritarian regimes) to 10 (Full democracies). See The Economist Intelligence Unit (2016) for further information on the technical methodology.

Sport tradition. Digel, Burk and Fahrner (2006) pointed out that, in addition to economic development, population, climate and socio-cultural factors, there are other variables which explain a country's success, such as its specialisation or tradition in a specific sport. For instance, five of the reviewed articles (Congdon-Hohman & Matheson, 2011; Hoffmann *et al.*, 2006; Jacobs, 2014; Klein, 2002; Torgler, 2008) consistently associate the strength of the women's national football team with the success of its men's counterpart (e.g. measured via Men's FIFA Ranking points and qualification for the FIFA World Cup final stages). This would suggest that women's football is more likely to flourish in countries where traditionally men's football is a successful sport. Consistent with this, Wicker and Frick (2016) evaluated the inspirational effects that the sporting achievements of men's and women's football have on participation rates for boys and girls in a country such as Germany, a country that is traditionally successful both in men's and women's football. Their findings indicate that only the achievements in men's football can lead to positive changes in participation rates for both boys and girls, implying that women's football participation is one legacy of success in the men's game. This, in turn, might lead to improved women's football international outcomes as a result of an increased talent pool. However, in an alternate analysis, Cho (2013) tested the direct association between men's and women's football international success through instrumental variable techniques and country-specific fixed-effects, suggesting that the success of men cannot be considered as a significant determinant of women's football performance. Based on these findings, it remains challenging to understand fully the direct and indirect expected relationship between men's and women's football success.

Table 1 provides a summary of previous literature on determinants of international sporting success in women's football.

[Table 1 here]

Our study's contribution to the literature

Building on the existing literature, the present research aims to contribute to the discussion of factors influencing a country's international success. More precisely, we will examine the significance and direction of the association between programme-level factors and international success. Taking into account longitudinal data for both macro and meso variables at the same time, this study will explore the effect of elite sport policies on sporting success. This article will investigate the impact of two previously unexplored policy areas in women's football: financial support and coaching provision. In addition, this study will provide supplementary evidence in relation to macro-level factors. For example, a more fine-grained measure will be employed to account for the effect of talent pool (i.e. exact number of active players within each country), while the Democracy Index will be used for the first time in women's football as an indicator of a country's political conditions.

Method

Dataset and variables

The UEFA reports on women's football (UEFA, 2011, 2012, 2013, 2014, 2015, 2016, 2017) were drawn on to provide the foundation for the empirical analysis in this study. The reports, published annually since 2011, rely on a survey that comprises over 50 questions specific to women's football. Importantly, responses come directly from either performance directors or the head of women's football in each of the 55 UEFA members. This also helps us to anticipate a potential limitation related to the consistency of indicators selected for programme-level factors given that measures are already standardised across countries. Nonetheless, from the information available, we could control for programmes implemented

in 48 of the 55 UEFA NFAs⁴. The period examined for this study is from 2011 to 2017. Data on programme-level factors refer to the year(s) preceding the sporting outcome (measured via the FIFA Women's World Ranking), as there will often be a lag between the implementation of a programme and any impact on sporting success. This means that information on sporting success is collected from 2012 to 2017, while measures for programme-level factors refer to the period from 2011 to 2016. This facilitates the identification of the effect of programmes on sporting performance (i.e. one- to five-year time-lag predictors were chosen), which will be affected in the following year(s), thus alleviating the causality problem. The final sample consists of $n = 258$ observations.

Table 2 gives an overview of all measures employed for this study. The dependent variable is the FIFA Women's World Ranking (WWR). Used in previous studies, the FIFA WWR reflects the comparative strength and success of a country in women's football. Points are accumulated in relation to the historical performance of the senior national team in international matches. Countries can gain or lose points based on criteria such as final results, goal difference and goals scored. The FIFA WWR controls for the importance of the match and the expected value (based on current strength) of each competing team before a match⁵. Hence, this measure helps provide an overall impression of how women's football is run in each country. Accordingly, a higher number of points would indicate a more successful country in women's football and vice versa.

[Table 2 here]

⁴ Some countries present missing data for the entire period for some variables. These include Gibraltar, where data was missing for six years, and Kosovo, where it was missing for one year. This is also due to their official recognition as UEFA members only taking place in 2013 and 2016.

⁵ The FIFA Women's World Ranking (WWR) adopts a modified Elo ranking system and takes into account a team's previous performances as "the rating points which a team earns for a win is dependent on the strength of the opponent" (FIFA, 2018). To illustrate, "a win over an extremely weak team scarcely improves their standing in the WWR, while a win over a stronger team is awarded with a clear increase of the WWR value" (FIFA, 2018). The FIFA Men's ranking has adopted the same system since august 2018, having previously been frequently criticised.

To guide the selection and formulation of relevant indicators for sport programme factors, we followed the nine pillars and key success factors identified in the SPLISS model (De Bosscher et al., 2006; De Bosscher et al., 2015). However, adapting information that is available from UEFA reports, we could only consider programmes within four policy areas, specifically: financial support, human resources, coaching provision and foundation phase. The exclusion of the remaining five pillars is due to the impracticality of matching critical success factors for each of these pillars with information available from the reports.

The first independent variable refers to financial support for women's football. From the UEFA reports, we can access the exact budget that each NFA has allocated solely to sustain women's football between 2011 and 2017. As pointed out by De Bosscher et al. (2006), financial support is considered a necessary condition to build the overall sport policy process. Consequently, we would expect a positive association with sporting success, although it should be noted that De Bosscher, Shibli and Weber (2018) have recently found ambiguous conclusions as to whether prioritisation as a deliberate strategic choice is an efficient way to invest funding. With regards to the time horizon(s) within which financial investment is expected to display its impact on sporting success, we could not find relevant literature that helps us to formulate an exact prediction. For this reason, we explored the impact of financial support on sporting success over different years (from $t-1$ to $t-5$).

The second independent variable considers the level of human resources that is available for the administration of women's football within each NFA. Jacobs (2014) proxies this through a dummy variable indicating whether at least three full-time staff worked in an NFA's women's football department. However, we acknowledge that there is no strong consensus regarding what constitutes an effective use of human resources within national sport governing bodies, as this can vary according to the context. For instance, terms such as organisational 'efficiency' and 'structure' can be relative to the size of a country and/or of the

NFA. The same applies to the notion of ‘good governance’, which is based on principles that might be interpreted differently depending on the context. For example, these include accountability and transparency, stakeholder representation, democratic processes, control mechanisms, sport integrity and ethical responsibility (Chappelet & Mrkonjic, 2013). Moreover, it is challenging to find evidence that helps quantitatively account for the optimal functioning of sport governing bodies. Nevertheless, De Bosscher et al. (2006) suggest that one of the critical success factors in the achievement of an integrated approach to policy development relates to the presence of full-time staff responsible for the development and support of various stakeholders (e.g. coaches, athletes) and activities to promote elite sports (e.g. marketing, communication). As such, we chose to proxy human resources through the number of full-time staff dedicated solely to women’s football. This information is available via UEFA reports. Following Jacobs (2014), we would expect a positive impact on sporting success in the short-term ($t-1$).

The third independent variable is related to the quality of coaching provided to the senior national team. To control for the coaching specialism and expertise of the senior national team’s coach, we use the UEFA coaching qualification pyramid⁶ and create a dummy variable indicating whether or not the coach holds the highest qualification, the UEFA Pro Licence. Holding a UEFA Pro Licence implies that a coach is highly specialised. This would be expected to provide the team with an opportunity to increase the quality and level of training and thus positively affect performance. Yet, in terms of how coaching can influence team success, it has been observed that managers’ contribution to team performance is not precisely measurable (Pieper, Nüesch & Franck, 2014). However, a number of studies (e.g. Frick & Simmons, 2008; Tan, Zheng & Dickson, 2019; Wicker, Orlowski & Breuer, 2018) indicate that coach quality

⁶ UEFA introduced a mandatory coaching qualification system for those occupying professional management and coaching positions in football. This includes five levels ranging from National qualification to UEFA Pro Licence.

and expertise can positively influence team success. In particular, Castagna et al. (2009) argue that specialism of coaches can help enhance players' training standards which, in turn, positively impact players' performance within months. Thus, coaching provision would be expected to produce a positive effect in the short-term ($t-1$).

The fourth independent variable represents initiatives implemented at the foundation phase (or grassroots level). These include NFAs' efforts to support programmes for the promotion of the game amongst young girls. Specifically, a dummy variable was created indicating whether formal links are established between clubs and schools. In theory, this should help an NFA encourage participation at grassroots level and, at the same time, allow the creation of pathways for young athletes towards elite sport (De Bosscher et al., 2006). Accordingly, sustaining grassroots activities would be expected to be fruitful for the senior national team's success in the long-term ($t-5$).

As in previous research, this study controls for contextual effects. These include: economic development, talent pool, climate, political system, gender equality and sport tradition. The logged GDP per capita is used as an indicator of the quality of infrastructure or leisure time available to potential athletes (Hoffmann et al., 2006). The logged measure of total registered players is included as a proxy for a country's talent pool. Contrary to the estimated values used in previous studies, this measure permits identification of the exact number of players who actively take part in women's football. Climate conditions are controlled through the squared term of a country's annual average temperature minus 14°C. For political system, this research relies on the Democracy Index. A country's gender equality is controlled through the ratio female-to-male labour force participation rate. The remaining independent variable, a country's football tradition, is measured via the FIFA points attained by the men's national team.

Before moving to the estimation strategy, inter-relationships between independent variables and their correlation with the dependent variable were tested. This was to have an initial understanding of the associations between the different variables. Correlations are summarised in Table 3.

[Table 3 here]

All independent variables displayed significant correlations with the dependent variable, ranging from 0.21 to 0.83. A strong correlation between talent pool and sporting success (0.83) was expected, as explained in the literature review section. Also, the strong association between democracy and economic development (0.78) was predictable (see Robinson, 2006, for a discussion). All programme-level factors displayed low to moderate levels of correlation with each other, ranging from 0.11 to 0.48.

Estimation strategy

Next, we estimate panel data models using Stata 14.2 with country as panel variable and year as time variable to measure the effect of programme-level factors and macro-level variables on international women's football performance. When it comes to testing the impact of a programme or a policy, unobserved heterogeneity between cross-sections needs to be controlled. Therefore, it is necessary to introduce a fixed or random effect estimator which allows clustering of data based on each specific country. Moreover, this helps distinguish within-country variation from between-country variation (see Table 4 in the next section).

We ran the fixed- and random-effects estimators, verifying the significance of the following model with i and t denoting respectively the country and the season:

$$\text{Women's performance}_{it} = \beta_0 + \beta_1 \text{Programme-level factors}_{it} + \beta_2 \text{Country-level factors}_{it} + \mu_{it}$$

To decide which estimator should be given preference, we formally tested the difference between fixed- and random-effects through the Hausman test. Results of the Hausman test rejected the null hypothesis for all models, indicating that fixed-effects estimators should be used. We then ran the modified Wald test for group-wise heteroscedasticity on each configuration with fixed-effect. This unveiled heteroscedasticity in our data ($\text{Prob} > \chi^2 = 0.000$). Therefore, fixed-effect estimators were ran again with robust standard errors. Panel regressions with fixed-effects and robust standard errors revealed non-significant results for our baseline models (i.e. $\text{Prob} > F$ is higher than .05). For this reason, we gradually removed the least significant variable from each configuration and tested fixed- and random-effects estimators a second time. Based on the new configurations, the results of the Hausman test rejected the null hypothesis with the exception of that with one-year lag, indicating that preference should be given to the random-effects estimator in this case. Heteroscedasticity was present in all models with fixed-effects. Robust standard errors were therefore applied for these models. Results of these regression models were non-significant ($\text{Prob} > F$ is higher than .05). For the only model estimated through random-effects (i.e. one-year lag without variables controlling for financial support and human resources), the Breusch and Pagan Lagrangian multiplier test for random effects confirmed the presence of significant differences across units (i.e. panel effect). However, Woolridge test for autocorrelation in panel data indicated the presence of autocorrelation. In view of that, we bootstrapped the results of the random-effects estimator via 1,000 replications.

Overall, five sets of models were estimated to verify the effect of programme-level factors on sporting success while controlling for macro-level variables. Each set followed lagged predictors from one to five. Significant regressions (i.e. $\text{Prob} > F$ lower than .05) were limited to one set of models. This was calculated via the random-effect estimator (with and without bootstrap) while controlling for coaching provision ($t-1$) and macro-level variables. In

addition to these, a third model including only macro-level variables is displayed in order to identify the amount of variance that is explained by coaching provision (i.e. the only programme-level indicator that shows significant effect on success)..

Results and discussion

Descriptive statistics

While most regression models are non-significant⁷, looking at between- and within-variations of the observed variables helps to paint a picture of the current situation of women's football in the UEFA nations. For instance, financial support data shows that England, France, Norway and Sweden consistently provide high levels of resources to women's football, while Eastern European countries such as Albania, Bosnia and Herzegovina and Montenegro invest less. Also, financial support varies more across than within countries. The country with the highest within-country variation for financial support is Israel. The mean number of staff dedicated solely to women's football is 5.40. In total, there are 17 observations indicating no members of staff dedicated solely to women's football. Similar to financial support, between-country variation is higher than within-country variation for this factor. For this variable, Russia presents the highest within-variation in the sample. About half (50.8%) of the countries for which data is available on coaching qualifications indicate the presence of a UEFA Pro licenced coach managing their senior national team. Contrary to the first two programme-level variables, coaching provision varies more within than between countries, with Armenia showing the highest level of within-variation. 53.8% of countries observed have established a direct connection between national schools and women's football clubs in the previous five

⁷ Non-significant regression models are presented in Appendix (Table 6).

years. As for financial support and human resources, foundation phase varies more between than within countries⁸.

Overall, between-country variation is greater than within-country variation for financial support, human resources and foundation phase, while coaching provision presents the opposite. This means that most NFAs have only marginally altered their budget and use of human resources across the years. In contrast, NFAs have dedicated more attention to the quality of coaching provided to the senior national team. Challenges in finding significant results through our fixed-effect estimators might also be due to low levels of within-country variation for three of the four programme factors. Based on the descriptive statistics, however, it is important to note that most NFAs are unlikely to make considerable changes in elements like budget and full-time staff. Therefore, although elite sport policy literature has reported an increasing degree of convergence and homogenisation between elite sport systems in different countries (e.g. Green & Houlihan, 2005; Houlihan, 2009; Oakley & Green, 2001), this closer inspection of programme-level variables highlights that differences still exist between countries in women's football.

[Table 4 here]

With regard to country-level variables, Luxembourg, Norway and Switzerland have strong income per capita, while Armenia, Moldova and Ukraine are among those countries that have weaker economies. Nations such as Germany, the Netherlands and Sweden rely on large talent pools, while Albania, Armenia, Georgia and Montenegro have lower numbers of registered players. Average temperature represented in the dataset ranges from -0.6° (Russia) to 19.2° (Israel). Of the states for which there is available information, Scandinavian countries

⁸ A comment about the country with the highest within-variation for this factor is not presented because data for this policy area are lagged for 5 years, therefore within-variation can only be observed for one remaining year.

such as Denmark, Iceland, Norway and Sweden present high scores on the Democracy Index while Belarus, Kazakhstan and Russia are consistently classified as nations with authoritarian governments (i.e. Democracy Index < 4). Similar to democracy levels, higher degrees of gender equality are found in Scandinavian countries, while in contrast, Bosnia and Herzegovina, Macedonia, Malta and Turkey display gender inequality. Finally, our proxy for a country's tradition in men's football indicates that Belgium, Germany, the Netherlands, Portugal and Spain are ranked among the highest positions in the FIFA Men's ranking for the observed period, while low levels of sporting attainment in men's football were reported for Macedonia, Malta and Moldova.

Regression analyses

Table 5 reports the results of the regression analyses examining the short-term effect of programme-level factors on international women's football outcomes (Models 1 and 2). These are limited to the configuration with one-year lag for coaching provision due to regressions with other programme-level variables providing non-significant results (Prob > F is higher than .05). Model 3 includes only country-level variables.

[Table 5 here]

Panel data analysis allows the distinction of within- R^2 from between- R^2 . In the models presented here, it appears clear that factors included in the equation explain more than 50% of between-country variation and account for a minimal difference in within-country variation (1%). As a result, only a small part of the impact that a change in these variables have on an individual country's international success can be explained. Instead, the effect of the observed factors is easier to detect when countries are compared to one another. Given that both between- R^2 and within- R^2 remain practically unchanged when the only significant sport programme-level factor is excluded (Model 3), it can be argued that, even when dealing with longitudinal

data, recognising the effect of sport policy-factors is inherently problematic (Dowling et al., 2018; Henry et al., 2005).

Looking at the results of Model 1 and Model 2, coaching provision significantly and positively affects women's football performance in the short-term, consistent with the proposition that coaching expertise and specialism can help players enhance their performances (Castagna et al., 2009; Frick & Simmons, 2008). Based on the UEFA reports, however, most of the countries that are expected to perform well in women's football (due to their socio-economic status and talent pool) already have an expert coach. Nonetheless, there are nations such as Turkey and Russia which might expect to marginally increase their levels of performance by investing in this area, either developing their present coach or hiring a more qualified one.

Focussing on country-level variables, economic development and men's football legacy are found as significant predictors of women's football performance with the expected signs based on previous literature about international success in women's football (e.g. Hoffman et al., 2006; Jacobs, 2014). For talent pool, the results reveal a positive effect on international women's football performances. However, this is non-significant in Model 2. The positive sign for climate in Models 1 and 3 indicates that countries that are far from 14°C perform better in women's football. This finding supports the expectation that colder countries are more successful in women's football (Congdon-Hohman & Matheson, 2011; Hoffman et al., 2006; Jacobs, 2014; Torgler, 2008). Nevertheless, this finding should be interpreted with caution since women's football has been developed earlier in (colder) Northern European countries (mostly Scandinavian). As such, the success of these countries might also be attributable to other elements. For instance, Scandinavian countries are also the best in terms of gender equality. On this, while we find gender equality having a non-significant impact, the results of a separate model (not reported here) excluding climate present a significantly positive

coefficient for gender equality⁹. Finally, a country's democracy level, which has not been tested previously in the literature with this specific focus, has a non-significant impact across all specifications.

Conclusions

Given the growing interest of nations in gaining a competitive advantage in elite sport, an increasing number of studies have sought to identify common features of successful national elite sport systems. However, while the purpose of comparative research in elite sport has been predominantly to describe, classify and formulate hypothesis on how nations achieve international success (Dowling et al., 2018), in this paper we applied an empirical approach to test the longitudinal relationship between a country's sport programmes and its outcomes in high performance sport. By employing longitudinal data, we contributed to the existing literature on comparative elite sport policies and helped to move the focus of research from investigating *static* associations between programme-level factors and international success to examining the *dynamic* impact that these variables can have on a country's performance. To the best of our knowledge, this study represents the first attempt to inspect the longitudinal effect of programme-level factors on international sporting success in comparative elite sport policy research.

The results of this study show that predictors of international success in women's football can be identified by looking at differences across countries, while less explanatory power is provided by changes occurring within each country. However, this does not mean that sport governing bodies have no opportunity to foster success in the long run. Instead, this article

⁹ Results of this model are not reported here but are available upon request. The significant and positive effect of gender equality, however, turns out to be non-significant after the application of bootstrap. Other results are unchanged.

confirms that an exclusively quantitative approach is unable to illuminate the full complexity and richness of the different components that contribute to elite level international success in different countries (De Bosscher, 2018; Dowling et al., 2018; Henry et al., 2005).

Limitations and future research

Four main limitations are identified in the present study. First, the sample selected includes only information about UEFA member countries. Hence, conclusions drawn from this research might not be applicable in other football regions where contextual and sport programme factors present different characteristics and possibly cause different impacts on women's football performance. The programme-level factors tested in our research have been identified as key to the development of football in non-European countries (e.g. in China; Peng, Skinner & Houlihan, 2018) but their actual impact on women's football performance remains to be examined. Second, most models have non-significant results, meaning that our conclusions on the effect of programme-level factors are drawn from one model only (i.e. one-year lag). Alongside the empirical analysis of programme-level factors, there would be merit future research collecting qualitative data to further guide understanding as to how programme-level factors work in relation to each country's international success. Moreover, the analysis presented in this study attempts to investigate the importance of programme-level factors across different countries. Despite the fact that this assists us to generalise our findings over various contexts, future studies may focus on a specific country (or a more restricted group of countries) to allow closer examination of the effect caused by programmes on a country's (within-)variation in success. Third, the proxies that account for the four sport-policy areas are based upon available information. However, aspects related to financial support, human resources, coaching provision and foundation phase might be controlled differently and more precisely. For instance, we include the overall budget used by each NFA for the development of women's football in its country. Yet, we do not know precisely how (or indeed whether) this

sum is spent in each country. Similarly, foundation phase is measured through the existence of formal links between schools and clubs. Future research might use different measures (e.g. number of youth clubs) to operationalise this. The fourth limitation relates to the lack of clarity about the inter-relationship between the nine pillars of the SPLISS framework (Henry & Ko, 2013). From a theoretical point of view, it remains unclear whether all pillars are necessary to develop a successful nation at elite level. This might reflect the difficulties in finding significant results when operationalising each pillar and relating these to international success.

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Table 1. Summary of literature review about determinants of women's football international performance.

Factor	Proxy	Klein (2002)	Hoffman et al. (2006)	Torgler (2008)	Congdon- Hohman & Matheson (2011)	Cho (2013)	Jacobs (2014)	Brendtmann et al. (2016)
<i>Programme-level</i>							Short- term	Long- term
Human resources	Dummy: ≥ 3 FT Staff						+	+
Training availability	≥ 4 Senior weekly training sessions						+	
Grassroots participation and foundation	Dummy: ≥ 7 Years of girls' soccer in school							n.s.
Talent ID and development	Dummy: National youth team							n.s.
Talent ID and development	Dummy: ≥ 4 youth weekly training sessions							+
<i>Country-level</i>								
Economic development	GDP/Capita	+	+	+	+ / n.s.	+	+	+
Population	Total population	+	+	+	+			+
	Female population					+		
	Female population (15-64)						+	

Factor	Proxy	Klein (2002)	Hoffman et al. (2006)	Torgler (2008)	Congdon- Hohman & Matheson (2011)	Cho (2013)	Jacobs (2014)	Brendtmann et al. (2016)
Climate	Average temperature		n.s.	-	-		-	
	Dummy: Tropics							n.s.
Latin heritage	Dummy: Latin origin		n.s.		n.s.		n.s.	
Gender equality	Female-to-male labour force	+			+		+	
	% women in government	+			+			
	Fertility rate	n.s.						
	Female-to-male income		+					
	Gender Inequality Index				+			
	Female-to-male secondary enrolment				+			
	Female labour force participation					+		+
	Life expectancy							+
Religion	Dummy: Muslim	n.s.			-			
Political system	Dummy: Communism		+		+		n.s.	
Men's football legacy	Dummy: qualified for World Cup	+				n.s.	+	

Factor	Proxy	Klein (2002)	Hoffman et al. (2006)	Torgler (2008)	Congdon- Hohman & Matheson (2011)	Cho (2013)	Jacobs (2014)	Brendtmann et al. (2016)
	Dummy: ever hosted World Cup		+	+				
	FIFA Ranking		+	+				
	FIFA Points				+	+		
	Dummy: ever won World Cup			+				

Note: dependent variable: women's performance; (+) indicates a significant positive association; (-) indicates a negative significant negative association; (n.s.) indicates a non-significant association.

Table 2. Description and data sources of variables.

Variable	Proxy	Source
Women’s performance	FIFA Women’s World Ranking points	FIFA.com
<i>Programme-level</i>		
Financial support	Budget for women’s football (Log)	UEFA (2011, 2012, 2013, 2014, 2015, 2016, 2017)
Human resources	Number of full-time staff	
Coaching provision	Senior national team coach license UEFA Pro (dummy: 1- yes)	
Foundation phase	Link clubs-school (dummy: 1 – yes)	
<i>Country-level</i>		
Economic development	GDP per capita (Log)	The World Bank (2017)
Talent pool	Total registered players (Log)	UEFA (2011, 2012, 2013, 2014, 2015, 2016, 2017)
Climate	(Yearly average temperature – 14°C) ²	Weatherbase.com (2017)
Democracy	Democracy Index	The Economist Intelligence Unit (2016)
Gender equality	Female-to-male labour force participation rate	The World Bank (2017)
Men’s football legacy	FIFA Men’s World Ranking points	FIFA.com

Table 3. Correlation matrix of selected variables.

		1	2	3	4	5	6	7	8	9	10
1	Women's performance										
	<i>Programme-level</i>										
2	Financial support	.77*									
3	Human resources	.48*	.51*								
4	Coaching provision	.34*	.33*	.11							
5	Foundation phase	.21*	.27*	.21*	.24*						
	<i>Country-level</i>										
6	Economic development	.48*	.40*	.15*	.18*	.06					
7	Talent pool	.83*	.82*	.46*	.31*	.16	.39*				
8	Climate	.21*	.19*	.09	.00	.04	.20*	.24*			
9	Democracy	.43*	.37*	.10	.29*	.22*	.78*	.49*	.03		
10	Gender equality	.38*	.27*	.13*	.21*	.09	.36*	.20*	.40*	.36*	
11	Men's football legacy	.68*	.59*	.32*	.35*	.11	.15*	.66*	-.07	.30*	.04

Note: 1-year lag is used for Financial support, Human resources and Coaching provision; 5-year lag is used for Foundation phase.

* $p < 0.05$

Table 4. Descriptive statistics of selected variables.

Variable	N		Mean	SD
Women's performance	258	Overall	1563.88	278.43
		Between		289.45
		Within		26.56
<i>Programme-level</i>				
Financial support	243	Overall	13.62	1.29
		Between		1.23
		Within		0.47
Human resources	249	Overall	5.40	6.63
		Between		4.99
		Within		4.20
Coaching provision	258	Overall	0.50	0.50
		Between		0.34
		Within		0.36
Foundation phase	93	Overall	0.53	0.51
		Between		0.52
		Within		0.27
<i>Country-level</i>				
Economic development	258	Overall	9.88	0.91
		Between		0.97
		Within		0.09
Talent pool	258	Overall	8.70	1.83
		Between		1.84
		Within		0.45
Climate	258	Overall	39.08	40.24
		Between		39.53
		Within		0
Democracy	258	Overall	7.36	1.61
		Between		1.65
		Within		0.15
Gender equality	258	Overall	77.87	8.98

Variable	N		Mean	SD
Men's football legacy	258	Between		8.66
		Within		1.71
		Overall	721.76	330.56
		Between		314.64
		Within		129.01

Table 5. Panel regression tests for predictors of women's football performance.

	Model 1		Model 2		Model 3	
	Coeff. (SE)	Sign.	Coeff. (SE)	Sign.	Coeff. (SE)	Sign.
Coaching provision	13.68 (6.69)	**	13.68 (7.01)	*		
Economic development	87.21 (20.34)	***	87.21 (32.57)	**	88.01 (20.49)	***
Talent pool	14.85 (5.08)	**	14.85 (10.79)		15.66 (5.13)	**
Climate	1.09 (.52)	**	1.09 (.79)		1.07 (.52)	**
Democracy	3.17 (11.99)		3.17 (16.18)		2.46 (12.07)	
Gender equality	1.73 (1.25)		1.73 (1.77)		1.81 (1.27)	
Men's football legacy	.05 (.01)	**	.05 (.02)	**	.05 (.01)	**
Constant	319.33 (180.20)	*	319.33 (292.63)		310.38 (181.17)	*
Observations		258			258	
Groups		48			48	
Within-R ²		.01			.00	
Between-R ²		.54			.54	
Overall-R ²		.52			.52	
rho		.91			.91	

Note: Displayed are the coefficients (standard errors in parentheses) of random-effects estimator (through the command xtreg in Stata). Panel variable is country and time variable is year. 1-year lag predictor is used for Coaching provision. Results of Model 2 are based on bootstrap with 1,000 replications. The dependent variable is: Women's football performance.

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.001$.

Appendix

Table 6. Non-significant panel regression tests for predictors of women's football performance.

	Model 4		Model 5		Model 6		Model 7		Model 8	
	Coeff. (SE)	Sign.	Coeff. (SE)	Sign.	Coeff. (SE)	Sign.	Coeff. (SE)	Sign.	Coeff. (SE)	Sign.
Financial support	-.90 (4.32)		.57 (3.84)		1.58 (3.22)		1.47 (3.23)		-2.18 (5.08)	
Human resources	.21 (.47)		.37 (.51)		-.10 (.47)		-.54 (.50)		-1.57 (.92)	
Coaching provision	8.24 (5.23)		5.15 (6.09)		6.24 (5.68)		9.86 (6.42)		9.91 (9.85)	
Foundation phase									15.28 (7.70)	*
Economic dev.	50.11 (22.42)	**	39.41 (23.05)	*	15.44 (21.86)		-18.02 (36.84)		-10.58 (64.85)	
Talent pool	-3.96 (4.54)		-.73 (5.52)		-3.12 (4.33)		.54 (5.56)		3.25 (6.73)	
Climate	Omitted		Omitted		Omitted		Omitted		Omitted	
Democracy	-28.63 (12.83)	**	-26.82 (13.84)	*	-3.01 (13.64)		1.36 (16.37)		Omitted	
Gender equality	.38 (1.08)		.17 (1.04)		Omitted		Omitted		Omitted	
Men's football legacy	.02 (.01)		.01 (.01)		-.01 (.01)		-.02 (.02)		-.00 (.03)	
Constant	1277.83 (251.58)	***	1341.63 (267.72)	***	1438.89 (244.43)	***	1712.61 (382.24)	***	1660.92 (598.52)	**
Observations	235		201		166		124		80	
Groups	48		48		46		46		45	
Within-R ²	.08		.05		.02		.05		.25	
Between-R ²	.04		.04		.00		.43		.17	
Overall-R ²	.05		.07		.00		.45		.13	

	Model 4	Model 5	Model 6	Model 7	Model 8
rho	.98	.99	.99	.99	.99

Note: All models presented here show Prob > F higher than .05. Displayed are the coefficients (standard errors in parentheses) of fixed-effects estimator (through the command xtreg in Stata). Panel variable is country and time variable is year. 1-year lag predictor is used for Human resources and Coaching provision across all models; 1-year lag predictor is used for Financial support in Model 4; 2-year lag predictor is used for Financial support in Model 5; 3-year lag predictor is used for Financial support in Model 6; 4-year lag predictor is used for Financial support in Model 7; 5-year lag predictor is used for Financial support and Foundation phase in Model 8. The dependent variable is: Women's football performance.

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.001$.